Intermontanus

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Announcements

As most of you know by now this is the last newsletter that I am going to edit. However, it might not mean the end of the Utah Association of Herpetologists, as I once thought. Over the last couple of weeks I have been contacted by two people who are fairly serious about keeping the group going.

Carlene Meyer, the owner of Reptile Gardens would like to organize meetings for all those interested in keeping amphibians and reptiles. Unlike our previous meetings, these meetings would focus more on captive husbandry and be more of a social get-together. Some aspects of the new meeting structure still need to be worked out, but they should satisfy a need that has not been considered previously by the group. Carlene will send meeting notices to all UtAH members who live in the state. If you have any specific suggestions or want to make sure that you will be notified about the meetings please contact Carlene at: Reptile Gardens, 2465 North Main #9, Sunset, UT 84015, or call (801)-776-6552.

In addition to the new meetings, I have also been contacted by someone who might want to take over the editing of the newsletter. If the newsletter does continue, you can expect some changes to the format and content. The current newsletter has reflected my ideas and interests which are not specific to herpetoculture. The new editor's interests are more husbandry oriented and I am sure the newsletter will reflect this interest. I hope that more people will submit articles to the new editor than have in the past. One of the reasons I have decided to step down from the editor position is because I simply can not continue to write the bulk of each newsletter. I am being vague about the new editor because they have not committed themselves to the project yet.

If the group does continue you should also expect the dues to increase significantly. I have been willing to supplement everyone's dues, but I do not expect the new editor to do the same. Depending on how future newsletters are printed (and mailed), I would expect the dues to be at least $15.00/year and perhaps more, just to cover the actual costs. Once everything has been set, an announcement will be sent to all current members.

Just in case the newsletter does not continue, there are other western societies that publish good newsletters. They are:
Arizona Herpetological Association, P.O. Box 66712, Phoenix, AZ 85082-6712.

Colorado Herpetological Society, P.O. Box 150381, Lakewood, CO 80215.

Idaho Herpetological Society, P.O. Box 44484, Boise, ID 83711-0484.

Northern Nevada Herpetological Society, P.O. Box 5812, Reno, NV 89513-5812.

Southern Nevada Herpetological Society, P.O. Box 4753, Las Vegas, NV 89127-0753.

Tucson Herpetological Society, P.O. Box 31531, Tucson, AZ 85751-1531.

Since this is my last newsletter I would like to take a little space to thank some people who have played a significant roll in UtAH over the last five years. Cynthia Lleyson has kindly read each issue before it was printed and offered numerous suggestions concerning the content and my editing. Her assistance is especially appreciated since she has little interest in herpetology.

Stan Draper has also read many of the issues before they were printed as well as contributed a number of articles. In addition to this assistance, Stan has always been available to help anyone with a question about herpetoculture. If the group were to give a "member of the year" award, Stan would have several of them.

I would also like to thank all of the people who have submitted items for the newsletter. Even when I did not use what was sent it was always nice to receive them. The many people who offered comments about the newsletter and the group also deserve recognition, although there are too many to list, you know who you are.

BREEDING SALAMANDERS OF THE GENUS *HYNOBIUS*

by Donald Smee, Logan, Utah; Jun Ikeda, Japan; Henk Wallays, Belgium; and Ad Bouwman, The Netherlands

Occurring only in the Far East are a group of salamanders of the family Hynobiidae which are evolutionarily designated as primitive because they reproduce by external fertilization (similar to frogs). The female of the species lays an egg sac in water, which is then fertilized by one or more males in the vicinity. Most other salamanders breed by internal fertilization. This happens when the male deposits a spermatophore on the surface of the ground or else on the bottom of a pond or stream (depending on the species). The

female takes it into her cloaca, and the sperm fertilize the eggs internally.

The Hynobiidae family has several genera of which *Hynobius* is the type genus, and the one with the most species. For its small land size, Japan has the most number of different *Hynobius*, with 15 species. Mainland Asia (China and Korea) has an additional four species, and Taiwan has three species of this salamander. The Hynobiids are typical-looking salamanders with smooth skin; they do not look like newts. The average length is about 4 inches, but some members of the genus grow to 8 inches.

The majority of the *Hynobius* salamanders are drab in coloration (unattractive), a lot of them being plain brown, tan, or black. Examples of these include *Hynobius boulengeri* and *Hynobius retardatus*. Many have tiny dark spots on a lighter background covering their dorsal surface, a coloration which differs from other salamanders around the world. Salamanders with this coloration include *Hynobius nebulosus*, *Hynobius dunni*, and *Hynobius chinensis*. A few of the more rare species have light blotches or markings on a darker background and are quite colorful, such as *Hynobius stejnegeri* and *Hynobius sonani*. The coloration and body appearance of many of these salamanders is similar to certain species of the genus *Ambystoma* in the United States. For example, *Hynobius boulengeri* and *Hynobius retardatus* are similar in appearance to the Jefferson salamander (*Ambystoma jeffersonianum*). *Hynobius lichenatus* approximates the coloration of the smallmouth salamander (*Ambystoma texanum*). *Hynobius sonani* is similar in color to the flatwoods salamander (*Ambystoma cingulatum*).

The adult *Hynobius* salamanders are rarely seen in the wild because they spend most of their time underground in burrows. Indeed they are similar to the genus *Ambystoma* of North America in this manner. During the breeding season (usually winter to early spring) adult *Hynobius* can be found congregating in ponds or streams for short periods of time. Larvae are more readily observed than the adults since they are present in ponds for 3-4 months, or up to 2 years in streams (taking longer to metamorphose than pond dwellers). The *Hynobius* salamanders are differentiated into two groups based upon reproductive habitat: the lotic (stream) and lentic (pond) breeders. It is analogous to breeding of the United States species *Ambystoma barbouri* (streamside salamander) in streams or *Ambystoma texanum* in ponds (both of these salamanders are very closely related morphologically).

Hynobius sp. are rare in private collections in the United States and Europe. Those persons that have them have tried captive breeding, with varying degree of success. We wish to report our efforts in caring for and breeding this species in captivity.

Some years ago, F. Van Leewen and Rens Vos described their breeding experiences with *Hynobius leechii* in captivity. Their animals reproduced the first year after metamorphosis. The reproductive efficiency improved in the years thereafter as the female animals got older and larger. After about four years the breeding success of the animals diminished and then completely stopped. What caused this phenomenon was a riddle, and they asked for tips and knowledge which could aid to restore the reproduction.

One of us (Bouwman) studied the breeding of this species over several years. A colony of *H. leechii* was obtained from an island off the coast of South Korea, which was started from two egg sacs of larvae. It was this beginning of having large numbers of animals to work with that may have contributed to the breeding success.

The terrarium where the *H. leechii* are kept stands in an unheated cool room. In there the outside temperature influences the inner temperature a lot. The inner arrangement of the terrarium consists of a very humid land area and a water part. The animals can be found on the land area for most of the year. In November the adult (and reproductively ready) males go into the water, where they remain until spring. In this winter period the animals reproduce. A short time after the males enter the water, their tails broaden vertically, their cloaca swells, and the throat gets gray. The females enter the water later, after which their bodies thicken and a pink color develops at their hind end, indicating that eggs are beginning to develop in their bodies.

In the beginning of March 1990 two females deposited egg sacs for the first time (each spawning consisted of two egg sacs of 50–80 eggs each laid at different times); these appeared to get fertilized by the males. The disappointment was great when it seemed that of the first spawning only three eggs of the early spawning and none from the later spawning were fertilized, based on their lack of maturation. The next year both females deposited egg sacs again in the same time period. The result was the same as the prior year; only the first spawning produced a few fertilized eggs. All spawnings were laid at water temperatures of 15°C. One of the possible conclusions was that the sperm of the males was not of the right quality that it could fertilize all the eggs.

Starting from this initial experiment in breeding, the *Hynobius* were kept in the fall of 1991 at lower temperatures. Because the terrarium already stood in an unheated place and because there was no colder place in the house, the terrarium of salamanders was moved outside in the beginning of October. They remained outdoors until mid-December; after this date, night frost was predicted. To prevent having to cut the salamanders out of the ice if freezing occurred, they were taken back into the house. The last weeks the animals had been standing outside, the temperature fluctuated between 3 and 6°C in the terrarium. The males had already entered the water (and remained there) and the females were on land. Both male and female animals were not so active at these temperatures. Once inside the house again, the temperature rose and the animals became more active.

Previously the males normally got their reproduction time started at the end of December, by now it was mid-January. The reason for this delay may be attributed to low temperatures. Females did not spawn their egg sacs at the beginning of March, but at the end of March or beginning of April and the males showed no interest in spawnings, thus the egg sacs remained unfertilized. The males swam anxiously around the females when the females were spawning, but did not attempt to fertilize the egg sacs.

Utah Association of Herpetologists

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A complete set of *Intermontanus* should include five volumes and 30 issues (six per volume).

The following libraries have complete sets:
American Museum of Natural History
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Utah State University
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Despite the bad results, this experience was not totally senseless. It became clear that reproduction gets delayed by low temperatures and that this is more pronounced with the females than with the males. Due to the low temperatures, the eggs in the females body develop too slowly. At the time when they are ready to get laid, the sperm of the males is possibly so diminished in quality that it is not able to fertilize the eggs. Or as was observed, the males do not even attempt to fertilize the eggs. It was evident that the reproductive cycle of males apparently was not synchronous with that of females. Perhaps this could be prevented by keeping the animals at higher temperatures, during period of egg development and spermatogenesis, than in previous years. By doing this egg development would speed up and the eggs could be laid earlier. With the males, a higher temperature could lead to hastening their fertile period. It seemed well to test this hypothesis.

Beginning January of 1993, when the eggs were developing, the temperature in the terrarium was raised from 10 to 15°C over a period of three days. As a result the first spawning took place on 8 February. Approximately 40% of the eggs were fertilized, from which one could conclude that the sperm of the males was already degrading at that time. After this experience it was concluded that the males were most fertile during the last weeks of January (probably sooner). So an attempt must be made to get the females to deposit their egg sacs during that same time period.

From beginning of November 1993 the males were gradually observed more frequently in the water. On 1 December seven males had already spent a long time in the water. A few days later three females went into the water too. On 15 December it was observed that in two females eggs were developing. After this the water temperature was slowly raised in the terrarium from 7-10°C to 15°C in early January. On 13 January two males deposited scent marks at the same spots in the terrarium. This behavior is only seen just before the females deposit their eggs. The remaining males stayed in the environment of the two now very thick females. These males probably deposited scent marks also. Regularly the animals made waving movement with their body and tails. This did not happen in fixed locations, but in the direct environment of females now ready to spawn. Apparently the females showed no reaction. Instead, they showed more interest in the places where the two males had set their scent marks. On 14 January two spawnings were made at these locations. One sac contained 80 eggs, out of which about 65 larvae developed. The other one contained very few eggs, which appeared not to be viable.

The first days after egg deposition males were frequently in the neighborhood of the good spawning. Sometimes they still tried to fertilize the eggs in the sacs. After a few days this behavior diminished and after 6 days they showed no more interest in the eggs. After 14 days the egg sacs were removed from the terrarium and put into another aquarium at 15°C. The first larvae came out of the egg sac on 12 February through the opening at the bottom. On 22 February most larvae had left the egg sac.

Live food that the larvae ate in captivity include artemia and infusoria (unicellular microbes); later they ate tubifex, bloodworms and daphnia. The larvae grew quickly and were not cannibalistic. Metamorphosis was in 6-8 weeks at average length of 30 mm. Once metamorphosed, they grew very slowly to adulthood. Food on land included fruit flies, wax moths, crickets, earthworms and other small arthropods. Adults were reproductively fertile at two years.

Breeding of *H. nebulosus* was tried by another one of us (Smee). Reports from the literature indicated that injection with gonadotropin would lead to reproduction of *Hynobius*. In the winter of 1995–96 four of these animals (two of each sex) were kept in the refrigerator at 10°C for three weeks, then returned to a basement room temperature (about 18°C). They were fed at 3 and 7 days later (earthworms and crickets). On the tenth day they were each injected (both males and females) with 200 units of human chorionic gonadotropin. Their land container was opened up and suspended on bricks in an aquarium. The animals were free to go from land to water. Five days later two egg sacs were deposited. The deposition of the sacs and activity of the males was not observed however, since Smee was on a business trip at the time.

One of the egg sacs had about 60 eggs, the other had about 10 eggs. The appearance of the large sac was spiral in shape, typical of the genus. It was deposited on a plastic aquarium plant. The other one was laid in moss on land (the salamander probably failed to find the exit to the aquarium). These eggs were shriveled up, but when placed in the water they looked normal after a few days. It was presumed that all of the eggs were fertile. After a month, none of the eggs developed to any degree although they still looked viable. However, later they underwent degradation, indicating they were infertile. This was a big disappointment. Once eggs are laid, males need to fertilize the egg sacs quickly as the outside jelly of the sac gets harder and becomes impenetrable for the sperm. It may take a larger number of male animals to get the job done to fertilize the eggs. Or perhaps there was a synchrony problem between male and female reproduction, as Bouwman described above.

Henk Wallays has ten specimens of *H. dunni* that will be used for breeding the natural way, with possibly consideration for breeding of a few specimens by injection with gonadotropin. His *H. dunni* need to mature for another year or so before they are mature. Of all of us, Jun Ikeda is the only one that has the opportunity to see these salamanders in the wild under native conditions. This is a very satisfying experience. The rest of us must resort to captive care. These salamanders are quite interesting, feed well in captivity, and are a durable in captivity. Unfortunately most U.S. and European hobbyists will never see one of these salamanders in their lifetime.

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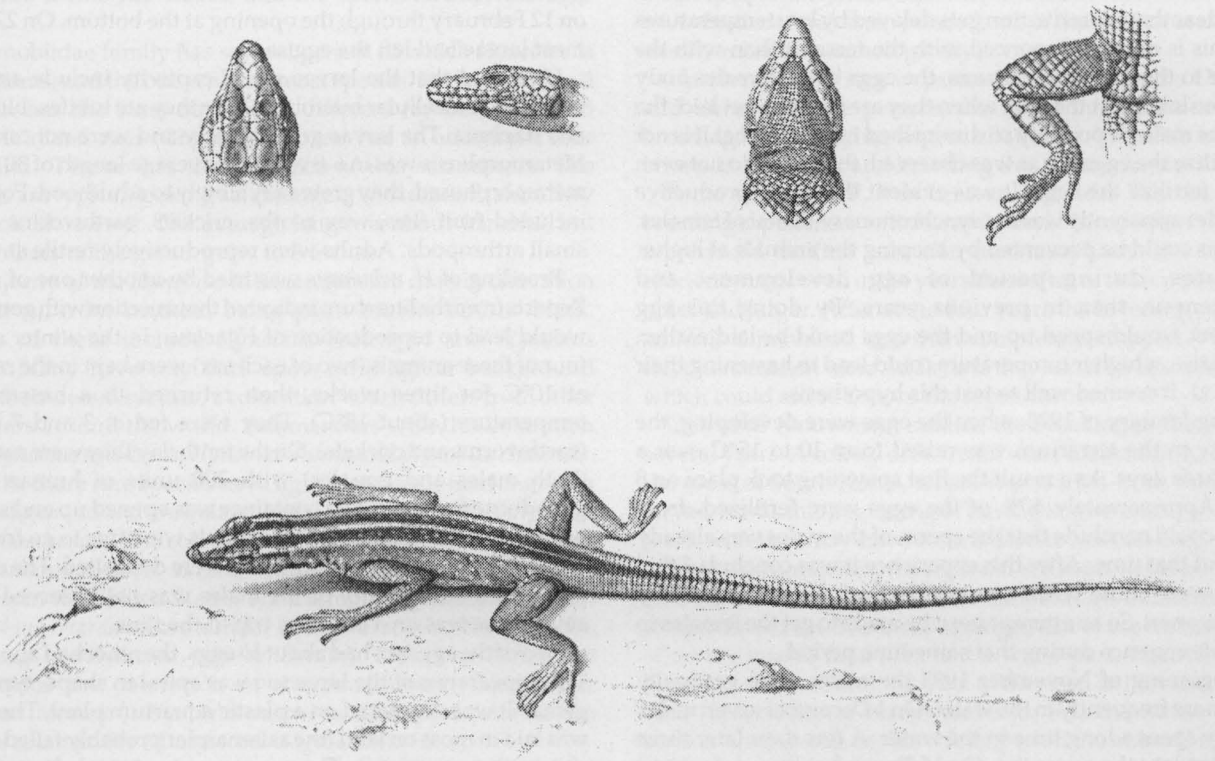

Part of plate IXA of *Platysaurus torquatus* from W.C.H. Peters 1882. Zoologie III. Amphibien. Naturwissen-schaftliche Reise nach Mossambique auf Befehl Seiner Majestät des Königs Friedrich Wilhelm IV. In den Jahren 1842 bis 1848 ausgeführt von Wilhelm C. H. Peters. (Actual size)

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